

Water Administration System (WAS)

1.1 PURPOSE OF THE WAS PROGRAM

The Water Administration System (WAS) is designed to be a water management tool for irrigation schemes, Water User Associations (WUA's), Catchment Management Agencies (CMA's) and water management offices that want to manage their water usage, water distribution and water accounts.

The main aim during the development of the WAS program was to minimise water losses for irrigation schemes that work on the demand system and that distribute water through canal networks. Currently the WAS program is in use at all the major irrigation schemes cross South Africa and it manages an irrigated area of more than 142 000 ha including 9 500 farms. The main benefits of using the WAS program is:

- The minimising of water distribution losses.
- The excellent management of water quota allocations and water usage per farmer.
- The availability of an extensive list of water reports on farm and scheme level.
- The increased productivity of scheme management personnel.
- An integrated debit accounting system that improves debit management.
- The improvement of the overall water administration management on irrigation schemes.

Table 1: Irrigation schemes where the WAS program is used

| Irrigation Scheme | Area (ha) | Quota allocation (m ³ /ha) | Full quota (m ³) | Abstraction points | Years in use |
|--------------------------------------|----------------|---------------------------------------|------------------------------|--------------------|--------------|
| Impala Water Users Association | 17,012 | 10,000 | 170,120,000 | 423 | 10 |
| Gamtoos Irrigation Board | 7,408 | 6,000 | 44,448,000 | 808 | 3 |
| Groenland Irrigation Board | 5,864 | 6,000 | 35,184,000 | 146 | 6 |
| Hartbeespoort Irrigation Board | 13,915 | 6,200 | 86,273,000 | 1,721 | 9 |
| Hereford Irrigation Board | 3,425 | 7,700 | 26,372,500 | 53 | 3 |
| Korentte Vetteriver Irrigation Board | 852 | 7,000 | 5,964,000 | 121 | 4 |
| Lower Olifants River WUA | 9,212 | 12,200 | 112,386,400 | 1,415 | 10 |
| Loskop Irrigation Board | 16,135 | 7,700 | 124,239,500 | 794 | 15 |
| Groot Marico Government Water Scheme | 2,523 | 5,300 | 13,371,900 | 309 | 5 |
| Mooririver Government Water Scheme | 4,954 | 7,700 | 38,145,800 | 603 | 12 |
| Orange Riet WUA | 15,941 | 11,000 | 175,351,000 | 679 | 6 |
| Sandvet Government Water Scheme | 10,542 | 1,080 | 11,385,360 | 616 | 10 |
| Vaalharts WUA | 35,060 | 9,140 | 320,448,400 | 1,873 | 12 |
| | | | | | |
| Totals | 142,843 | | 1,163,689,860 | 9,561 | |

The WAS database can handle any number of abstraction points and measuring stations on canal networks, pipelines and rivers.

1.2 TYPES OF APPLICATION

WAS is an integrated database driven system with many water management capabilities. WAS can be implemented in a small water office that manages a few abstractions and measuring stations up to a CMA level that manages thousands of abstractions and measuring stations. WAS is used for the efficient administration of:

- Address information.
- Scheduled or rateable areas.
- Water quota allocations.
- Water delivered through pressure-regulated sluice gates, measuring structures and water

meters.

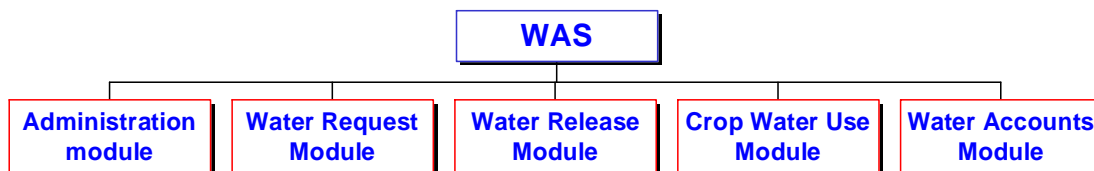
- Water transfers between users (Automatic and manually).
- Water use calculations for planted areas based on crop water use data.
- Date and time related flow data collected from electronic loggers or mechanical chart recorders.
- Discharge tables (DT) to do conversions between water depth and flow rate for measuring structures or vice versa.
- List of rateable areas (LRA) information.
- Calculation of water releases for water distribution through canal networks, pipelines and rivers taking lag times, evaporation, transpiration and seepage into account.
- Billing system that links to the water usage information.
- Flexible user charges based on water usage, a flat rate or scheduled area.
- Images and photos that can be linked to different types of information in the database.
- Automatic weather station database with a built in calculation of Eto values.
- Mail merge facility for sending letters to clients.

The WAS program saves all information in a Firebird database that can be installed on a single PC or on a server for use over a network. This makes it possible for the scheme manager, accounts personnel and water office personnel to access the database from PC's in their own offices. There is no limitation on the number of PC's that can be linked to the database.

What makes the WAS program unique is the fact that it is an integrated system that includes the water allocations, water use, water distribution and billing information. WAS will generate monthly invoices automatically using water usage or scheduled areas information captured in the database. Different user names and passwords can be used to control access to certain information in the database.

1.3 MODULES

WAS consists of five modules that are integrated into a single program that can be used on a single PC or a multi-user environment. These modules can be implemented partially or as a whole, depending on the requirements of the specific scheme or office. The five modules are:



Administration module

This module is used to administer the details of all water users on an irrigation scheme. Information managed by this module includes addresses, notes, cut-off list, images/photos, list of rateable areas, scheduled areas, household and livestock pipes installed on canals, industrial water quotas, crops and areas planted and crop yields. The administration module must be implemented before any other module can be used.

Water request module

This module is used to administer water abstractions from canal networks, pipelines and rivers and it keeps track of water quota allocations and water usage. Water abstractions can be captured in three different ways.

- Standard water request forms such as the ones currently used by the Department of Water Affairs and Forestry and a few irrigation boards and water user associations. Provides for original requests, additional requests and cancellation of water.
- Meter readings that can be captured on a weekly or monthly basis. The end reading of the previous period is automatically transferred to the start reading of the current period.
- Date and time related data that can be imported from electronic data loggers. Water usage can be calculated between specified date and time ranges.

The water request module also has extensive water reporting capabilities such as:

- Water balance sheet per abstraction.
- Water balance report that can summarise the water usage per abstraction and all the abstractions per farmer.
- Water usage per month report.
- Operator defined water reports to compile weekly, monthly, quarterly and yearly water usage reports.

Most of the water reports have extensive find, sort and filtering capabilities. Abstraction points can be linked in such a way that water is transferred from a master to an extension automatically. There is no limit to the number of extensions that can be linked to a master.

Crop water use module

The main function of the crop water use module is to calculate the water usage per crop between two specified dates for all the planted crops on a scheme based on the plant date, the area planted and the crop water use curve. The crop yield (ton/ha) can be captured at the end of a growing season which is used to calculate the total yield (ton) and the yield in (g/m³). A summary of water used for a specified period can easily be generated per crop type. All the crop water use information can easily be linked to a geographic information system (GIS) via ODBC and the Land ID field in the crop water use module.

Water accounts module

This module links with the water request module and administers all water accounts for an irrigation scheme or water management office. The water accounts module is a full debit system, from which monthly reports can be printed, including invoices on pre-printed stationery, reconciliation reports, age analysis and audit trail reports.

Water release module

This module links with the water request module and calculates water releases for the main canal or river and all its branches and tributaries allowing for lag times and any water losses and accruals. A schematic layout of the total canal network or river system is captured with detail such as the cross-sectional properties, positioning of sluices or pumps, canal or river slope, structures and canal or river capacities. Discharges are converted to the corresponding measuring plate readings where needed. Water distribution sheets can be printed for canal or river systems.

1.4 WATER SAVINGS

Many years of research went into the development of the WAS program with its main aim to minimize water losses on irrigation schemes. Field measurements indicated water savings of between 10 to 20 percent on implementing the water release module of the WAS program alone. Big water loss reduction on an irrigation scheme points towards previous bad water management practices and this is a very sensitive issue on irrigation schemes in South Africa. The WAS program is therefore implemented systematically without publishing any water loss improvements.

The different modules of the WAS program can be implemented partially or as a whole, depending on the requirements of a specific scheme. It makes therefore sense to implement the modules that makes the biggest difference first.

It is also important to emphasize that a computerised water management system like the WAS program prevents human errors that can lead to potentially huge water losses. Feedback from WAS users at training courses indicates that after converting, it is considered impossible to manage irrigation schemes without the use of the WAS program.